THE VETERINARY RECORD

A Weekly Journal for the Profession.

Edited by WILLIAM HUNTING, F.R.C.V.S.

No. 915. JANUARY 20, 1906. VOL. XVIII

DISEASES OF ANIMALS—1905.

The returns of the Board of Agriculture for 1905 certainly show progress. The outbreaks of swine fever for the year amounted to 817 against 1,188 for the previous year. The outbreaks of sheep-scab were 919 against 1,387 for the year 1904. Rabies and foot-and-mouth disease were absent. Anthrax shows 967 outbreaks against 1,023 for the previous year; and Glanders 1,209 outbreaks against 1,507 in 1904. Although not so bad as in 1904 the returns of Anthrax and Glanders are evidence that something more is necessary in the way of regulations for control. It is really sad to think that in the last 25 years over £1,000,000 worth of horses has been sacrificed to one disease in this country. During the South African war horses were found in plenty. Now, owing to commercial and other causes, it would be quite impossible to collect the animals we might need if another war occurred. Whereas a few years ago 40,000 horses came annually from America, now the trade is extinct, and Europe is unable to supply the ordinary trade requirements of the country. Our own horse-supply is well worth protecting, and the annual loss of 2,000 animals from glanders alone might be a serious national calamity.

THE TESTIMONIAL FUND.

We publish this week the names of the gentlemen who have joined the Committee formed to present some permanent testimonial to Sir John M'Fadyean. What form the testimonial is to take will be settled at a meeting of the contributors, who will be informed of the time and place later. Of course the choice will depend greatly upon the amount of the fund, and those subscribers who cannot attend will have the privilege of writing—their suggestions will have proper attention even if the writers are unable to be present.

It is to be hoped that no note of discord will arise. It is impossible to please everyone and the most ignorant and prejudiced have often the loudest voices. Even the banquet, at which everything seemed to go smoothly, has not given universal satisfaction. A small clique, which perhaps ought to be ignored, has imagined that some disrespect was shown to the veterinary profession. It is almost needless to say that the very fact of the banquet being given is evidence that only honour to our guest and to our profession was intended. It is true the best intentions may be badly put into practice, but how disrespect to the profession can be read into the proceedings passes our comprehension. There are men capable of finding fault with anything. Their intelligence and experience are more often at fault than their good feeling, but such microcephalus specimens should endeavour to learn before they criticise.

IRREDUCIBLE UMBILICAL HERNIA IN CALF.

Immediate attendance was requested to a valuable calf, which was reported to have a large tumour hanging from its belly. I learnt it had been born about three hours, and that the tumour was noticed at its birth. It was lying very quiet, all but its head covered with clean straw, and upon turning it on its back, the fore legs being held by the farmer and the hind ones by his wife, I found the enlargement pear-shaped, about the size of a cocoanut, the constricted portion originating from the umbilical opening. After cleansing it I could easily see it was composed of a number of coils of intestine enclosed within a peritoneal sac; the neck of the sac could be followed through the umbilical aperture with the finger. I bathed the tumour and used gentle kneading for some time. It was not tympanitic so I did not tap it. Being unsuccessful in returning the same, I told the owner its only chance was to have the navel ring enlarged, and to this he readily assented. I now inserted my finger and passing in sideways my probe-pointed bistoury I turned the edge towards the sternum and enlarged the ring some three inches, after which I managed to gradually return the bowel, but when they were nearly all inside my patient struggled and out came fresh coil of intestines from the abdominal cavity. This process had to be repeated several times and I thought it was going to beat me, for so soon as I got in one set another wriggled out of the other end of the aperture, and it was not until I had the hind quarters held off the ground, when he did not appear to have such power in pushing them out, that I eventually returned them all. After which I gather up together the two edges of the skin, and after pulling them fairly tight stitched through and through, taking care to keep the intestines back by my finger before pushing through the needle. The sutures were not pulled very tight as I did not wish to cause sloughing of the skin, and after free douching with carbolised oil the calf was allowed to rise without any bandaging, which I have always found difficult to retain in position, although I have seen several forms of trusses applied for umbilical hernia.

I saw this patient a month later when I found the stitches still intact, also a thickening about two fingers breadth over the navel ring, but no external wound, the calf doing remarkably well.

A DEAD CALF.

A blue-grey heifer, under two years old, reported in pain as if wanting to calve, but had two months to go before due. She had been running with four others in a large shed, and owner thought she must have been injured.

On arrival I found this heifer with a foot of cleansing hanging from the vagina, and the owner said he had not seen any calf, although she had been paining herself some three days.

I stripped, and examined *per rectum*; a calf could be easily felt, so I thoroughly cleansed my arm, and after anointing with vaseline, endeavoured to examine her *per vaginam*. I experienced great difficulty in getting my hand into the vagina as the parts were not at all relaxed; ultimately I did get it inside by a gently turning movement, and managed to reach the os uteri. I found it would only admit two fingers, so it was impossible to reach the calf, and I injected into the uterus some warm carbolised oil, and smeared the os with glycerinum c. belladonna, and advised that she be given twenty-four hours, and if on the expiration of that time she had not calved it should be reported to me. This the owner did, saying he could not see anything, and that she had pained herself at odd times, but never severely. I again visited her and on examination found the os sufficiently dilated to admit my hand, when I had no difficulty in finding a markedly emphysematous fœtus. I now eviscerated the fœtus and tapped the skin in several places, and after well lubricating the passages with linseed jelly I drew up the head and fore-legs and anticipated a speedy delivery, but when the fœtus was about half outside the vagina, to my disgust it separated at the loins, and I then had to get up both hind legs, and eventually delivered the hind parts.

After treatment consisted in washing out the uterus with a tepid antiseptic injection, a plaister applied over the loins, and the frequent administration of nourishing gruels, as she remained recumbent for a fortnight, but eventually made a good recovery.

F. G. Ashley.

CELOSOMIAN MONSTROSITY.

Subject.—An aged roan cross-bred cow, which had always calved safely previously. The abdominal viscera of the calf was presented at the vulva, and upon the hand being passed into the vagina, the curve in the spine of the calf could be felt just within the brim of the pelvis, and further forward the poll of the head and root of the tail in close proximity to each other. The whole of the abdominal viscera was removed and the calf divided through the dorsal vertebra, which took about 70 minutes. This done there was no difficulty in removing the two portions. The abdominal and thoracic parieties were absent. The cow made an uneventful recovery, doing as well as after a normal parturition.

Assistant.

ABSTRACTS FROM FOREIGN JOURNALS.

Pachydermy or Elephantiasis of the Head in a Bull.—By Veterinary Surgeon Eberhard, of Caymen.

On May 19th, 1905, I was shown a bull by Herr K, in L., which for about five weeks had been affected with an increasing swelling of the head.

In the first half of April the animal had eaten badly. Some days later the fore part of the head became swollen, and the bull resented any touching of the swelled area. At the end of April the bull was turned out to pasture with the rest of the cattle, and from this time his general condition improved. Painfulness of the swollen part disappeared, but the swelling continued to increase in size. The bull was born in March, 1904, so was quite a year old. He was cross-bred Dutch and in good condition.

From a distance an enormous unsightly swelling of the fore part of the head presented itself. The head was held down. Closer examination showed the underlip and the chin considerably thickened at the angles of the mouth, as well as the upper lip, the orifice of the mouth, and the cheeks. The illustration would have been better if the bull could have been persuaded to keep his head up.

The swelling was hard as bone, tense and unaffected by pressure. No painfulness, and little increased heat. The skin was not changed and was covered with hair, but immovable on the

tissues beneath. The mucous membrane of the mouth showed no changes. The nasal orifices were wide open and immovable. No difficulty in breathing. Examination of mouth and tongue (hard to accomplish) showed nothing abnormal. General condition good. Taking of nourishment not much interfered with.

The owner wished treatment despite bad prognosis. I ordered massage with spirituous lotions.

When I saw the bull again on June 5 I found no improvement. The swelling had increaaed, and the bull had gone back in condition, and was taking food badly. On my advice he was slaughtered.

Outside the affected locality things were normal. At the swollen part the subcutaneous connective tissue was greatly hypertrophied, hard and thick, and changed to a firm thick skin. The skin was thickened and grown over and attached to the subcutis. The muscular tissue was atrophied. The lymphatic glands swollen.

What was the ætiology of the illness? I believe it was due to an erysipelatous affection. The same we know by experience leads to pachydermie, but is seldom encountered in cattle. Actinomycosis requires differentiating from this.

In the above case the punctiform yellow masses in the new-formed tissue characteristic of actinomycosis were wanting.—*Berliner Thierärzt. Woch.*

G. M.

THE YORKSHIRE VETERINARY SOCIETY.

The autumn meeting was held at the Hotel Metropole, Leeds, on Friday, Oct. 27th, Mr. F. Hallilay, of Dewsbury, the retiring President, took the chair at the opening of the proceedings, and the following members were also present:—Messrs. A. W. Mason, H. G. Bowes, S. Wharam, G. E. Bowman, Wm. Crawford, A. McCarmick, and Frank Somers, Leeds; Prof. W. Owen Williams, F. W. S. Clough, Morley; J. McKinna, Huddersfield; J. S. Lloyd and J. Abson, Sheffield; A. T. Waller, Skipton; J. W. Lazenby, Tadcaster; Philip Deighton, Selby; A. Ellison, Harrogate; G. H. Pollock, York; H. Walpole, Whixley; George Whitehead, Batley; A. H. Watson, Bradford; J. Clarkson (Hon. Sec.), Garforth; and J. E. Scriven (Hon. Treasurer), Tadcaster. The following visitors were present: Lieut.-Col. E. H. Hazleton, A.V.D.; Messrs. James Smith, Wetherby; T. C. Fletcher, and S. E. Sampson, Sheffield; J. A. Dixon, Leeds; Horace L. Roberts, Manchester; A. Weighton, Hull; W. Achroyd, Halifax; R. V. Hicks, G. W. Tyson, and A. H. Berry.

Letters of apology for absence were received from Messrs. Barker, Paulett, Cooke, and H. Sumner.

A letter was read from Mr. J. Abson acknowledging the resolution of the Society congratulating him upon his election to the Presidency of the Royal College of Veterinary Surgeons.

At the last meeting Mr. Pollock brought a specimen of a tumour. The specimen had been sent on to Prof. M'Fadyean who, it was reported by the Secretary, had stated that it was a fibrous and not a glandular tumour.

Nomination of Members.

The following new members were nominated:—Messrs. J. A. Dixon, Leeds, nominated by Mr. Wharam, Arthur Weighton, Hull; T. C. Fletcher, Sheffield; Horace L. Roberts, Manchester; Bruce, Hull; Walter Ackroyd, Halifax, by Mr. Bowes; S. E. Sampson, Sheffield, by Mr. Lloyd; Bell, Brighouse, by Mr. Clarkson; James Smith, Wetherby, by Mr. Mason; Campbell, Boroughbridge; Sugden, Knaresbro', by Mr. Crawford; Richard Hayes, Sherburn, by Mr. Scriven.

New Members Elected.

Capt. M'Gowan, of Leeds, was elected a member on the motion of Mr. Bowes, seconded by Mr. Bowman.

Mr. G. H. Pollock, of York, on the proposition of Mr. Mason, seconded by Mr. Bowes.

Election of Office Bearers.

President.—Mr. Hallilay proposed Mr. A. W. Mason, who, he said, had already been President of the National Society and also President of the Yorkshire Society, and was well acquainted with the politics of the veterinary profession.

Mr. J. McKinna, who seconded the motion, said he was sure Mr. Mason would be an ornament to the Society and would maintain its best traditions.

Mr. Clarkson supported the motion, and remarked that Mr. Mason would make an exceptionally good President during the coming year, which he believed was going to be a particularly successful one.

The motion was carried.

Mr. Mason, on taking the chair, was heartily applauded. He said it was a great honour to be elected for the second time as President of one of the oldest societies in the Kingdom. The responsibility was not great, excepting in the sense that it would be his duty to try and make the Society a success, and he hoped the members would assist him in making their meetings sociable, entertaining and instructive.

Vice-Presidents.—Mr. Hallilay, the retiring President, became *ex-officio* one of the Vice-presidents, and the other two Vice-presidents elected were Mr. Lloyd, proposed by Mr. Bowes and seconded by Mr. McKinna, and Mr. McCarmick, proposed by Mr. McKinna and seconded by Mr. Hallilay.

Hon. Treasurer.—Mr. J. E. Scriven was relected on the motion of Mr. Lloyd, seconded by Mr. Bowes.

Hon. Secretary.—Mr. J. Clarkson was proposed for re-election by the President; this was seconded by the ex-President and carried.

Auditors.—Messrs. Wharam and Bowes were elected on the proposition of the Secretary, seconded by Mr. McKinna.

Council.—Messrs. Crawford, McKinna, Bowman, Whitehead, Clough, and Ellison were elected.

The Late Mr. W. F. Greenhalgh.

Mr. Whitehead proposed a vote of condolence with the widow of the late Mr. Greenhalgh who, though comparatively speaking a young man, had occupied the positions of both President snd Secretary of the Society.

Mr. Bowes seconded the motion.

The President, in supporting, described Mr. Greenhalgh as a good hearted man and a good professional brother, adding that he never heard that he ever trod on the corns of a brother practitioner. The office bearers sent a wreath and ten attended the funeral.

The motion was adopted in silence, the members rising in their places.

The Formation of a Library.

The question of the formation of a library of books and instruments was next considered.

The President observed that there were many books which were only books of reference, some of them very expensive, and it was thought that it would be a good idea to form the nucleus of a library.

The Secretary stated that the Council suggested that a book-case should be purchased at a cost not exceeding £10. The manager of the Hotel Metropole had undertaken to give members every facility for exchang-

ing books. Several books had already been promised, including a complete series of *The Record* from the commencement.

The PRESIDENT said three other gentlemen had each promised a volume.

Prof. Williams offered two and Mr. Somers three.

Mr. ROBERTS, a member of the Lancashire Society, stated that there was a library at Manchester, which had been found to be of great use.

Mr. BOWES proposed that a library be formed and that the President, the Secretary and the Treasurer be asked to purchase a book-case to cost not more than £10. He said the idea of the Council was not only that it should be a reference library, but that members at a distance should be able to write to the Secretary and have any book sent to them by post.

Mr. LLOYD, who seconded, thought the idea was one to be very much commended. They had over £30 in hand, so they could afford to buy the book case.

Mr. MCKINNA supported the propo-al, remarking that many of the members could not get some of the recent books, especially foreign ones, and the library would be a great benefit to them

The proposal was unanimously adopted.

At the suggestion of Mr. Bowes the framing of rules for the library was left to the Council.

PARLIAMENTARY REPRESENTATION.

The SECRETARY mentioned that at the last meeting the question of Parliamentary representation was referred to the Standing Council. The Council had come to the conclusion that if a workable scheme could be found it would be a good thing to adopt some measure of Parliamentary representation, and they suggested that the Yorkshire Society should support the Lancashire Society in their efforts, and if necessary appoint delegates to attend a conference.

Prof. WILLIAMS explained that at the recent meeting at which the subject was discussed there were two proposals—one, submitted by Mr. Fraser, to the effect that there should be Parliamentary representation direct; the other (proposed by himself) that they should have a better paid Secretary to attend the Lobby of the House of Commons. That meeting decided to send out circulars to all the Societies requesting them to send delegates to a conference to be held in some central place to discuss the pros and cons.

Mr. BOWES proposed that the recommendation of the Council should be adopted and that the President and Secretary be asked to attend the proposed conference, the Society paying their expenses.

Mr. BOWMAN seconded.

Prof. WILLIAMS suggested that the name of Mr. Bowman should be added, and the three gentlemen named were appointed delegates.

THE RECENT PUBLIC HEALTH CONGRESS.

Mr. HALLILAY submitted a report upon the Congress of the Royal Institute of Public Health held in London in July at which he and the Secretary represented this Society. After enumerating the chief points of some of the questions discussed, Mr. Hallilay said that all these subjects pointed one way; that was that greater veterinary inspection than now existed was required. By having representatives at large scientific congresses and other gatherings they were doing much to uphold the proper position of the profession.

On the proposition of Mr. Bowes, seconded by Mr. McKinna, thanks were accorded to Mr. Hallilay and Mr. Clarkson for attending the Congress.

THE TREASURER'S BALANCE SHEET.

The TREASURER presented his balance sheet as follows :—

RECEIPTS.	£	s.	d.
Balance forward	27	18	10
Subscriptions	34	13	0
Collected for Dinner		15	0
	£63	6	10

PAYMENTS.			
Rooms at Hotel Metropole	1	0	0
Dinners at „ „	6	8	0
Reporters at Meetings	6	6	0
Dinsdale for Printing	5	3	9
Wolstenholme, share of Election Expenses	2	18	2
Delegates to Royal Institute of Public Health	2	2	0
„ to London Congress ...	6	6	0
Secretary's Expenses	1	8	3
Treasurer's „		19	10
Balance in Bank	30	14	10
	£63	6	10

Subscriptions in Arrear £17 17s.

Mr. SCRIVEN explained that the expenses were rather heavier than last year, partly owing to the expenses of the delegates to the Congress of the Royal Institute of Public Health and partly in consequence of the printing of the new book of rules Last year the subscriptions in arrear were about £34; this year they were only 17 guineas, and this had been reduced since the report was printed. The balance now in the bank was £31 15s. 10d.

The report was received on the proposition of Mr. Whitehead, seconded by Mr. Lloyd, and on the motion of Mr. Abson, seconded by Mr. Bowman, it was adopted.

NOTICES OF MOTION.

Mr. BOWES gave notice that at the next meeting he would propose an alteration of Rule 3 by the following addition :—"Members of other local veterinary associations shall, if duly elected, be admitted to membership without payment of the entrance fee."

The SECRETARY, on behalf of Mr. Cooke, gave notice that at the next meeting he would move the reinstatement of the word "Medical" in the title of the Society.

PROFESSOR WILLIAMS ON "VETERINARY JURISPRUDENCE."

Professor W. OWEN WILLIAMS read an interesting paper on "Veterinary Jurisprudence." Forensic veterinary medicine, or veterinary jurisprudence, he stated, is a very different subject from forensic medicine, or medical jurisprudence. In human forensic medicine the medical expert has usually to give expert opinion as to the cause of injury, fatal or otherwise, be it accidental, self-inflicted or inflicted with intent, and be it violence or medicinal. The majority of cases in which the medical expert is engaged are—rape, murder, injury with intent, suicide by various methods and specially to distinguish them from murder, death from misadventure, killed by lightning, by electric current, drowning, choking, suffocation and various gases, and poisoning

Now the veterinary expert is seldom called in for most of the above-named subjects, though he occasionally is called in to give evidence in cases of mutilation of animals, such as ham-stringing and malicious poisoning. He might even be called in in cases of rape and divorce. Professor Williams mentioned two such cases in which veterinary evidence was called. Such cases, he remarked, are extremely uncommon, and were only given to illustrate the fact that for one to be a veterinary jurist he must have an extensive and thorough knowledge of all branches of his profession. Not only must the jurist possess this knowledge, but he must have the power of placing it in such words and form as

will make it perfectly intelligible to all concerned in the trial—judge, counsel, and jury. The use of technical terms must always be avoided, or, if used, must be clearly explained. No greater error can be made by the would-be veterinary or other jurist than by thinking that the use of technicalities will impress the judge, confuse the opposing counsel, and haze the jury. It is frequently of great use to judge, counsel, and jury if the veterinary witness produces photographs, specimens or models to illustrate the case. The Professor stated that he makes it a practice never to go into a case unless he is of opinion that there is right on his side; he prefers to see the papers of the case and form his own opinion as to whether or not the case can be won, and if he is of opinion that his client has no case he has no hesitation in saying so. Once Professor Williams was "precognosed"—as they say in Scotland, that is, he was examined by the solicitor before the case came on for trial—by a solicitor who was anxious to have the punishment of his guilty client modified, and if possible to have him fined instead of being sent to prison. The solicitor said to him, "You know all about the —— case, don't you?" "Yes," was the reply. "Well, what do you think about it?" "I think," replied Professor Williams, "that your client deserves twenty years' hard labour at least." Of course he was not called for the defence, but at the same time he received his "precognition" fee.

As a rule a veterinary surgeon appears both as a witness of fact (an ordinary witness) and as an expert or scientific witness. He may on giving evidence refer to his own *original* notes on the case, but not to *copies* of his original notes. Therefore, it is always advisable to carry a note-book in which to make notes in case he may be called upon to give evidence. As a witness he may, before taking the oath, decline to give evidence of an expert nature unless he is paid his fee or receives a sufficient guarantee that it will be paid him. Further, in Scotland at least, a witness is entitled to receive 48 hours' notice that he will be required to appear, otherwise he is not bound to go, even though he be subpœnaed within the forty-eight hours. Professor Williams well remembers a case in the Court of Session in Edinburgh many years ago in which a number of his late father's professional friends were called upon to give evidence, though he had carefully avoided being called, as he differed very much from these friends in their opinion. Anyhow the opposition discovered during the last twenty-four hours before the case came on that his father's evidence would be of great value to them, and they served a subpœna on him just as he was about to drive out from Gayfield. After reading the subpœna he calmly tore it up, flung the pieces in the air and said, "You can't get me, and *that* for your subpœna," and then drove off. Probably if he had been in Germany he would have been considered guilty of "lèse Majesté." I must say, continued Professor Williams, that I admire the Scotch custom of not allowing any witness prior to his examination to be in the court room while the case is proceeding. One is apt, when hearing other evidence, to become confused as regards one's own particular evidence, and to get a feeling that one would like to correct the barrister on one side or the other, or some question put to or answered by some other witness, or to explain to his Lordship something which perhaps even a professional brother has inadvertently or purposely misstated, and so misled his Lordship. Needless to say this is a hallucination on the part of a listener, as both judges and barristers are peculiarly alert, and though they may not exhibit any dubiety at the moment, and may seem to accept the statement, yet they take good care if in doubt to have the matter cleared up by some subsequent witness, at least the Judge does, though the opposing barrister does not necessarily. It is hardly necessary for me to impress all witnesses that they must address the judge and jury, if there be one, and not the audience, even if the the witness do feel inclined to be smart in repartee or to indulge in humour. It does not pay and it is bad form. Perhaps I may add that if it be impossible to avoid some little touch of humour it is just as well to do it apologetically, or deprecatingly, as if one were forced against one's will in such a solemn place to do such a thing.

Professor Williams gave a detailed list of various classes of cases in which members of the veterinary profession were called upon as experts to give evidence. He said that before proceeding to specialise on the main causes of death or disease it is necessary that they should be able to differentiate the various forms or modes of death, and approximate as to the length of time which has elapsed since death occurred, or the length of time which has elapsed since the infliction of the injury or the administration of a poison. On the question of malpractice he said he was glad to say he had never had to give evidence against a professional brother, and he sincerely hoped he never would.

On the motion of Mr. Hallilay, seconded by Mr. Bowes, a hearty vote of thanks was accorded to Professor Williams for his interesting and instructive paper, and at the suggestion of Mr. Bowes the discussion upon it was adjourned to the next meeting.

A vote of thanks to the late President for his services during the past year was adopted, on the proposition of Mr. Abson, seconded by Mr. McKinna, and Mr. Hallilay briefly responded.

On the motion of Mr. Lloyd, seconded by Professor Williams the other officers of the Society were also thanked.

THE SIR JOHN M'FADYEAN TESTIMONIAL FUND.

The replies to the first circular issued by the Committee who arranged the Banquet contained so many requests for a permanent Testimonial that it was decided to adopt the suggestion.

The gentlemen who have joined the Committee are as follows:—

Mr. Jno. Bee
Charles Gillard
S. Stockman
P. S. Howard
T. W. Lepper
J. Hammond
J. G. Parr
E. Wood
T. F. Hall
A. W. Mason
H. G. Bowes
W. S. Carless
Frank Leigh
W. Woods
F. J. Thornton
Arnold Porritt
P. G. Gibbings
J. Forgham
Wm. Anderson
Major Rowe
Capt. Martin
Major Butler
Mr. Jas. Blakeway
John Blakeway
F. L. Gooch
W. J. Marsden
E. Wallis Hoare
J. T. Abell
W. Freeman Barrett
Mr. Sam Locke
Gerald Bloxsome
E. R. Gibson
J. B. Nisbet
Hugh Kidd
J. A. Gold
A. E. Saunders
F. A. Ball
B. Freer
W. Shipley
W. E. Litt
W. Wilson
J. E. Miller
S. H. Slocock
C. A. Powell
Horace L. Roberts
J. Donald
T. K. Ramsay
Peter Bond
J. R. Carless
Chas. Hartley
T. M. Pettifer
W. Dale
Eaton Jones
R. Brydon
W. Hunting
W. J. Fletcher
W. A. Byrne
F. W. Cousens

Mr. F. J. Simpson
Ed. Batt
Jas. Clark
S. G. March
R. J. Hickes
G. Sinclair
E. Taylor
W. Renfrew
E. H. Pratt
R. G. Anderson
R. M. Hamilton
Gen. Thomson
Sir G. T. Brown
Sir R. P. Cooper, Bart.
Mr. G. H. Elder
W. A. Hancock
R. C. Trigger
R. C. Irving
H. G. Lepper
C. E. Dayus
J. Clarkson
S. E. Holmans
D. S. Rabagliati
C. H. Golledge
A. H. Darwell
W. Bloxsome
H. Holroyd
Frank Aulton
Henry Thompson
F. H. Gibbings
Dr. O. C. Bradley
Prof. Mettam
McCall
Dewar
Mr. John Troughear
Stafford Jackson
W. C. Hazelton
S. Villar
T. A. Dollar
Jas. Thompson
J. J. Philips
Jas. McKenny
Jno. Holland
W. A. Stainton
F. W. Robards
A. Dobbyn
Jas. Crowhurst
J. J. Crowhurst
Geo. Hunting
John Roberts
W. A. Macgregor
Dan Macgregor
F. Trewin
John Hammond, jun.
Geo. Thatcher
Wm. Roots
J. E. Grey
G. R. Dudgeon
J. Riddoch
J. C. Munby
G. P. Male
Matthew Clarke
H. A. Reid
W. C. Barling
A. H. Berry
Jas. Tagg
H. Caulton Reeks
W. H. Bloye
N. Almond
R. H. Stephenson
E. R. Edwards
H. C. Wilkie
Andrew Spreull
F. W. Taylor
H. E. Cross

Mr. Frank B. Gresham
Hugh A. MacCormack
M. Livock
Thos. Olver
Jno. Buckingham
J. K. Bruce
W. J. Taylor
Prof. F. Hobday
J. Macqueen
Jno. Penberthy
Mr. C. Burston
E. Lionel Stroud
G. H. Williams
Matthew Hedley
Jas. Peddie
F. G. Ashley
F. M. Wallis
H. W. Caton
Geo. Craik
H. J. Dawes
Jno. Malcolm
A. S. Adams
W. Littlewood
Alex. C. Cope
John Hutton
Clemt. Stephenson
J. S. Lloyd
Messrs. J. and H. Sumner
Woodger and Broad
Burrell and Son
R. J. Foreman
A. H. Gentle
J. R. Dykes
A. S. Auger
Jas. Macarthur
S. Wharam
Jas. Henderson
Walter Jowett
Chas. A. Squair
Jno. A. W. Dollar
A. C. Smart
Major D. J. Barry
Col. F. Smith
Colonel Duck
Mr. S. J. Hewitt
Warwick Fowle
W. A. Taylor
H. Hunter
R. A. Philp
Jas. Forbes
Thos. M'Connell
Major M. F. Case
G. Fowler
A. C. Newsom
Mr. R. E. Beilby
T. S. Price
W. T. Edwards
W. L. Weighill
W. D. Rees
Capt. W. A. Pallin
Col. Chas. Steel
Mr. H. K. Roberts
R. Rimmer
Jas. Douglas
J. F. Thurston
T. W. Cave
J. Alex. Todd
T. Ludlow
Messrs. J. Bell and Son
Grasby and Reynolds
Mr. J. W. McIntosh
G. Wartnaby
J. M. Stewart
J. B. Martin
J. C. Coleman

Prof. Share Jones
G. Wooldridge
H. Woodruff
J. F. Craig
Mr. W. T. Olver
Laurence McLaren
J. W. Rainey
G. Mayall
D. Hamilton
John Hammond, sen.
S. G. Chellew
Harry Peele
Peter Wilson
A. M. Trotter
A. Inglis McCallum
T. Runciman
T. B. Goodall
C. Parsons
Abraham Green
J. F. Mahony
J. Malone
Guy Sutton
Mark Tailby
Ernest Peacey
R. L. Green
A. Cornish-Bowden
J. M. McMaster
W. Hill
A. Chivas
J. C. De Ville
Geo. Gair
W. S. Worthington
R. G. Saunders
W. Ridgman
W. Cureton
Rich. Roberts
Dr. W. H. Dalrymple
R. Ebbitt
Mr. Thos. King
W. G. Schofield
F. W. Garnett
M. G. Byerley
J. B. Wolstenholme
Alex. Lawson
J. Bell
T. G. Heatley
Trevor Spencer
D. G. Davies
T. A. Frost
C. D. Watkins
E. Faulkner
J. Bainbridge
J. W. Baxter
W. F. Garside
G. E. Gibson
A. R. Routledge

Mr. R. Hughes
W. H. Whitlamsmith
W. R. Davis
Frank Somers
Chas. Allen
Jas. Abson
W. J. Mulvey
Alfred Over
J. D. Pottie
Jno. Davidson
W. H. Bartrum
W. J. Foreman
Major E. W. Larnder
Colonel Blenkinsop
Major Reilly
Capt. G. Conder
Mr. R. E. L. Penhale
C. T. Bray
C. W. B. Sikes
F. W. Wragg
W. Bower
W. H. Crowhurst
Jas. Laithwood
W. Penhale
J. A. Thompson
P. Beattie
P. J. Howard
J. Harrison
J. C. James
T. E. Auger
Chas. Peirce
J. F. Rees
J. P. Heyes
J. McKinna
F. T. Harvey
J. W. Rider
A. Le Sueur
G. F. Gould
J. A. Gold
Jas. R. Jackson
Walter Packman
Wm. Macdonald
T. G. Chesterman
F. W. Barling
W. J. Watt
S. H. Nye
Jos. H. Carter
Major Meredith
Capt. R. C. Cochrane
Lieut. H. Greenfield
Mr. Thos. J. Wooff
A. Rogerson
Malcolm Allan
Geo. C. Lowe
Walter Perryman
Chas. Sheather

Next week a list of subscriptions received will be published. A number are already in the hands of the Treasurer, but confusion will be avoided by acknowledging them distinct from the above list of Committee. Any gentleman whose name has been accidentally omitted from the list will oblige by sending a post-card to the Hon. Sec.

Yew Poisoning.

Three bullocks belonging to a Hawick butcher, which were grazing on a farm near Jedburgh, have died from the effects of eating the twigs of a yew tree. They had pushed their heads between the lines of a fence with which the tree was enclosed.—*The North British Agriculturist.*

THE PROBLEMS OF CANCER.

By E. F. Bashford, M.D.

General Superintendent of Research, and Director of the Laboratory, Imperial Cancer Research Fund.

Some three years ago the investigations of the Imperial Cancer Research Fund commenced. Those actively engaged in the task essayed to grapple with the disease, not as a problem of human pathology only, but as a comparative biological problem and one requiring experimental treatment. Dr. Murray and myself have striven to place the exact knowledge of the nature and incidence of the disease on a basis commensurate with its ramifications in men and animals. For on the one hand those facts which were matters of common knowledge to the medical profession were drawn from an extremely narrow field of investigation—namely, the study of the disease in man—and, on the contrary, the hypotheses explaining them ranged over the full field of biological knowledge and speculation. To preserve an attitude sufficiently free from bias was no easy matter, because all co-ordinated investigation must be conceived in terms of a working hypothesis of some sort.

Older Hypothetical Explanations of the Nature and Growth of Cancer.

At that time various hypotheses were prominently before the medical profession—three especially contested for favour. In the Cohnheim hypothesis and its variants an embryonic origin was postulated, and to the minds of many the only alternative to an awakening of latent powers of growth in "embryonic rests" was the acquisition of new powers of growth by adult differentiated tissue. What was the amount of growth requiring explanation? It was the amount which sufficed to cause a patient to succumb to cancer, and the explanations were formulated accordingly. The energy with which growth proceeded showed no diminution up to the time of death, and was loosely described as "limitless." How was this amount of growth to be elicited in either embryonic or adult tissue? Various forms of stimulus (for example, chronic irritation) were suggested. These suggestions were held to be an unsatisfactory answer to a question which the third hypothesis attempted to dispose of by assuming the intervention of a parasite to elicit the necessary power of growth.

The supporters of the two hypotheses first mentioned were not very active, partly owing to the absence of new facts to argue from, and partly from the necessity for testing the fresh evidence brought forward in support of the parasitic hypothesis The view that cancer was an infective disease directly transmissible from individual to individual was in favour in France, and also in Germany, where the statistical results of a census of all the cases of cancer recorded on a definite day throughout the German Empire had been adduced in its support for the first time. At home, on the Continent, and in America, most of the serious investigations were being directed to proving or disproving this hypothesis, although some suggestive work was being done bearing on the possible embryonic nature of tumours.

The causative influence of geological formation, of soil, of climate and diet, of dwelling near rivers and trees, all found advocates. Civilisation even was blamed for calling cancer into being; the negro in his native Africa was said to be free from cancer, the negro of America was known to be prone to it. The veterinary profession had shown that all the forms of cancer occurred in domesticated mammals, but medical men alleged, or were unable to disprove, that this was due to contact with man. Wild animals were said to be free from it. The evidence of its occurrence outside the mammals was regarded with the greatest distrust. Doubts were even expressed as to the identity of the disease in man and animals, although in 1899 Professor (now Sir John) M'Fadyean had protested against the assertion of a distinguished member of the medical profession that cancer was a disease peculiar to man.

The Investigation of Cancer still in a State of Confusion and Error.

The confusion of opinions and conflicting statements of fact were disconcerting in the extreme to the mere medical man seeking guidance. The chaotic state of the whole matter was emphasised by the absence of any criteria serving as guide-posts in the wilderness of fact and fiction. Obviously, where so much divergence of opinion was possible, many of the matters under discussion were open to ambiguity of interpretation or insufficiently supported by accurate observation. Investigation was hampered by the need for paying heed to a mass of disorderly details without any more obvious relation to one another than could be found for them in the imaginations of a multitude of authors wildly guessing at truth and formulating the problem they sought to solve in terms fitted less to the facts than to the solutions advanced. Truly, there was, and is, need for work—much work and accurate observation—to cope with the flood of speculation and to elevate the investigation of cancer from the kind of "Tom Tiddler's" domain it had become, and unfortunately still remains. From the outline I have given it will be evident to you that we had to attempt to solve, not one, but many problems associated with cancer.

Organised Attempt to Systematise Investigation.

Those responsible for the institution of what is now the Imperial Cancer Research Fund foresaw that only a very far-reaching scheme of inquiry, backed by the most disinterested supervision possible, that of the Royal Colleges of Physicians and Surgeons, would suffice to clear the ground. With the approval of the Executive Committee, I determined to pursue five preliminary lines of inquiry covering most of the points at issue discussed above, and affording means for submitting cancer to experimental study. In the first place it seemed essential: (1) to define the extent to which cancer occurred throughout the civilised and uncivilised races of man; (2) to determine the extent to which it pervaded the animal kingdom, outside of the domesticated animals; (3) to ascertain whether the disease was transferable; (4) to demonstrate that any experimental observations made were made with cancer in all ways comparable to that found in man, and to show the advantage of undertaking the study of specific problems in the animals best suited to their investigation; (5) The important deductions derived from statistics and their conflicting nature, together with the need for their valuable aid in furthering the zoological and biological lines of investigation, made it imperative to inquire into the uses to which statistics could be properly put, and to ascertain the reliability of the clinical and pathological data on which they must be based. In this connection the higher incidence of cancer in old age required special attention as a comparative biological problem; its statistical importance had long been recognised by accurate statisticians, and most fully emphasised by Newsholme.

These preliminary lines of inquiry being objective in nature, they permitted of investigation fairly free from bias. In their early stages they bore less on the nature of the disease, and more on the value of existing knowledge and the elucidation of the relation of known facts to one another. I shall not weary you with details of the organisation necessary for the conduct of those five lines of preliminary inquiry, in such a way that they formed parts of one co-ordinated investigation, the results of which will, I hope, show you that during the

past three years many contradictions have been resolved, fallacies have been exposed, new facts have been elicited, the experimental method of investigating cancer has been placed on a sure and comparative basis, and the whole field of inquiry narrowed.

Ethnological and Zoological Distribution.

The energy of medical and other Colonial officials speedily led to the discovery of cases of cancer in native races of mankind hitherto supposed to be exempt, dwelling in parts of the world remote from European civilisation. Where in the first instance the disease was not found cases have since been brought to notice. The inhabitants of Japan and China suffer from cancer, and upwards of 1,000 cases have now been reported from the numerous native castes coming under the observation of European medical officers in India. The Danish Government informed us of its occurrence in the Arctic regions.

The hearty response of the veterinary profession to the appeals addressed to them brought a surprising amount of material from domesticated mammals, and some from wild animals in captivity. One of our earliest cases was a carcinoma mammæ in a wild mouse. Malignant new growths were obtained from birds (tame and wild), some from fish—for example, from trout in hatcheries and from carp, also from marine fish living in a state of nature. Independently of us, Dr. Pick described cases of malignant new growths in a fowl, a giant salamander, and in trout, the last having been originally recorded by Miss Plehn. A large tumour in an oyster, described as long ago as 1887, has been brought to our notice, and efforts are being made to find out its true nature.

The information on all the above lines continues to accumulate, and the searchh as been taken up in widely separated parts of the world. A few weeks ago Sir Wm. McGregor forwarded a specimen of what is probably a malignant new growth in a codfish caught off Newfoundland, and Dr. Smallwood, of Syracuse, U.S.A., sent us specimens of a new growth in a frog, which we find is a columnar cell carcinoma infiltrating the kidney. Recently Professor Welsh, of Sydney, New South Wales, has also noted the occurrence of cancer in an aged lioness, an old tigress, and in a marsupial, likewise another growth in a frog. Dr. Pick, of Berlin, continues to augment our knowledge of malignant new growths in fish. His account of a painstaking investigation of carcinoma in trout aroused great attention last month at the Berlin Medical Society; many of Dr. Pick's hearers went to the meeting still doubting the existence of such things.

It soon became probable that all races of mankind were liable to cancer, and likewise all vertebrate animals, whether living in captivity or in a state of nature. To this general statement there is still one exception, which we have pointed out before—a true malignant new growth has not yet been described in a reptile—but evidence was bound to be late in coming in the case of some groups, and there is no obvious reason why reptiles and invertebrates should not also suffer from cancer. There are, of course, difficulties in obtaining reliable data on its relative frequency either in native races of man or in animals.

Identity of Cancer in Men and Animals.

I illustrate some of the facts alluded to by slides showing carcinoma mammæ, malignant adenoma of the mammæ, squamous-celled carcinoma of the jaw, adeno-carcinoma of the small intestine, etc., in the mouse (tame and wild); carcinoma and malignant adenoma in salamander and in frog; also in the trout, codfish, gurnard, and some examples of sarcomata, from which you will see that the histological lesions characteristic of the disease throughout the vertebrates are identical with those characteristic of the disease in man.

Constant Association with Old Age in Men and Animals.

I must, however, also tell you that cancer has the further remarkable common feature that in animals it has the same higher incidence in old age, and therefore the same relation to the duration of life as in man, which inuolves that in animals with a shorter life tenure the period of relative immunity is correspondingly shortened. Within the limited compass of the life of a mouse (3 years) there are condensed the vital activities which in man may occupy more than half a century, and all series of events are correspondingly shortened. The association of cancer with old age is the only factor known to be constantly associated and intimately bound up with the processes responsibile for the development of cancer in man and animals.

Limitations to Transmission and its Unique Features.

With apparent identity in the nature of a disease of such universal occurrence we were face to face with a new aspect of the old problem, was it transmissible? Did an infective agent entering the body from without link together the sporadic cases so widely distributed in the animal scale from civilised man to marine fish living in a state of nature? The surmise was quickly arrived at that external factors such as habitat, food, and conditions of life generally played little, if any, direct part in causing a disease showing constant and unique characters in organisms so divergent. The influence of such inconstant external agencies is probably a mediate one, as contrasted with the direct and constant association of cancer with old age. The essential factor or factors appear to be properties common to the cells of all the divergent organisms prone to the disease, and therefore the time of its appearance merely obeys the laws which set different limits to the compass of life. This conclusion would have been perhaps premature if drawn from the evidence of ethnological and zoological distribution alone. Concomitantly, however, the results of some of the other preliminary lines of enquiry showed that civilized man's responsibility for the occurrence of cancer in native races and domesticated animals was in all probability limited to providing them with an opportunity for reaching the "cancer ages."

To the newly-ascertained wide occurrence of the disease were also added (1) the knowledge of the still more astonishing limitations to its transmission, and (2) the discovery that cancer possessed powers of continued growth after the death of the original host, unparalleled either by organisms or tissues in the vertebrate kingdom.

We have attempted the experimental transmission of the disease on a most extensive scale. In mice alone we have performed upwards of 10,000 experiments. We have obtained incontrovertible evidence that the disease is only readily transmissible from one individual to another of the same species, or even of the same race. But to this restriction under favourable experimental conditions there are added yet, others, so that its transmission naturally from one individal to another is a very improbable contingency—a conclusion supported by the negative results of numernus experiments in which animals suffering from cancer have been housed with healthy animals.

Propagation succeeds as well in young animals as in old—perhaps better. Thus, although old age is constantly associated with the origin of cancer, it is not a necessary condition for the growth to continue when once it has started. Growth occurs in a large percentage of all the animals of the race used, and by re-inoculating those in which failure takes place in the first

instance, tumours can subsequently be obtained. Within one race there is little, if any, evidence of idiosyncrasy or varying suitability of the soil, as it were, and experiments show that succes and failure are determined almost, if not entirely, by factors within the tumour cells themselves.

The facts I have been relating refer to the mouse, the only animal in which carcinoma has been successfully propagated. A mouse cancer will only grow in other mice, that of a tame mouse only well in other tame mice of the same race, that of a wild mouse only in another wild mouse of the same race. The cancer of a tame or wild Danish, German, or French mouse grows with difficulty, or not at all, in the corresponding race of English mice. It has been absolutely impossible to get cells from a monse tumour to grow in any other species of animal.

The outstanding features in the artificial transmission of cancer are therefore: (1) The great difficulty of transmission as contrasted with that of the known infective diseases; (2) the continued vitality of the cancer cells as opposed to the death of the stroma cells, and renewal of the stroma by the reaction set up in the tissues of the host at each re-inoculation; (3) the cells descended from any one sporadic tumour, although apparently undifferentiated (embryonic) retain constant properties determining the specific nature of the stroma freshly supplied at each inoculation; (4) the importance of unsuspected subtle differences in different races of mice sufficient to determine success or failure, and, *per contra*, the unimportance of changes associated with age and other natural processes in the life cycle of the individuals of any one race when once cancerous growth has started; (5) the contrasts established between the transmission of cancer and all known processes of infection.

The contrast between the transmission of infection and the propagation of cancer is worthy of the serious attention of all those brought into contact with patients suffering from the disease, or engaged in its investigation. The degeneration of the stroma of cancer on inoculation from one animal to another illustrates also what happens to the tissues of a tuberculous nodule, if they be used to transmit tuberculosis to another animal; they degenerate, but they hand on the tubercle bacillus to the tissues of the new host, and these, becoming infected, themselves exhibit the peculiarities of the disease. The experimental transmission of cancer means the continued growth of the tumour cells of one animal in a succession of other animals. The tissues of the new hosts do not acquire any cancerous properties; they merely react to the presence of the cancer cells and supply them with nourishment. The process is fundamentally different and distinguishable from all known processes of infection.

The transference of cancer cells from one mouse to another therefore affords them an opportunity for continuing to grow in a succession of animals. Jensen's tumour is growing to-day with undiminished energy four years after the death of the mouse in which it arose, and therefore for a period of one year longer than a mouse lives. In our own experiments growth has proceeded in some 3,000 mice successively, all of which are now dead, yet the tumour cells themselves are multiplying in other mice as actively as ever, and producing enormous masses of tissue. The power of proliferation in this and four other tumours, stands in no relation to the normal length of life, nor to the limits set to the growth of a mouse. In describing the artificial propagation of cancer, Dr. Murray and I have pointed out that it is a phenomenon unparalleled in the vertebrates, and is a truer measure of the nature of the growth than that formerly known, which terminated in the death of a patient and itself ceased at that death. The experimental study of "expansive" and "infiltrative" growth shows that there is no essential difference between them. What is understood by the "malignancy" of a tumour is but a manifestation of the power of growth: a conclusion to which Ehrlich and Apolant have recently given confirmation.

General Conclusions.

Such is the difficulty of transmitting cancer from the tame mice in one country—for example, France or Germany—to the tame mice of England, and the all but impossibility of transmission from tame mice to wild mice, that I venture to assert that the prevalence of cancer among the negroes of America was not brought about by contact with cancer-infested white men. Cancer was inherent in the negroes when they were shipped from their native Africa, where it probably existed, as it still does to-day, in natives remote from civilisation. Nor has the white man been the focus from which the disease has spread throughout the vertebrate kingdom. The study of the limitations to the transmission of cancer shows that cancerous tissue possesses properties more specific to and distinct of a species than any of the criteria by which the zoologist separates one species from another, or than the differences which the "precipitin test" has revealed between the blood of even nearly-allied animals. Sporadically the disease arises *de novo* in each organism attacked, and appears to be a process to which the tissues of the most divergent organisms are liable in the old age period of life. The only alternative is to postulate that each species, race, and even tissue, has got its cancer, or rather cancers, which are handed on from generation to generation like some family heirloom. This assumes that cancers are themselves organisms implanted from individual to individual; that they are specific to the species, or even race, whose vitality they sap, and directly descended from some primæval cancer which started in remote geological ages. This supposition is entirely irrational, and is disproved by the fact that cancer is constantly a disease of old age, whereas old age is not necessary for the transmission and growth of cancer; there is therefore no reason why cancer, transmitted as supposed, should not prefer youthful animals, instead of being increasingly frequent as age advances. This *reductio ad absurdum* is but one demonstration of the value of the comparative and experimental method of studying cancer.

In the light of the knowledge we now possess, many of the problems that faced us three years ago have been solved, and many of the confusing statements to which I have drawn attention cease to be worthy of serious consideration. The occurrence of cancer in codfish off the banks of Newfoundland may not show that icebergs and fogs cause cancer, but it does show that dwelling in the neighbourhood of trees, or on a clay soil, living under the influence of civilisation, or indulgence in alcohol, are not indispensable to the appearance of cancer. Time prevents me adding many facts to those I have laid before you. I can only allude to the valuable aid the statistical investigations have been to the others, and state that the minute study of the prolonged artificial propagation of cancer shows that the energy and the amount of proliferation fluctuate from causes inherent in the cells themselves, and led us to discard, as being incompatible with the facts, the working hypothesis that growth might be maintained by the intercalation of heterotypical mitoses (like those of reproductive tissue), followed by nuclear fusion.

In our investigations we have obtained evidence against all the explanations yet advanced as to the cause and nature of cancer, proof that cancer cells have not reverted to an embryonic undifferentiated state, or that the growth and ceaseless cell division of cancer resembles the intermittent growth and cell division of repro-

ductive tissue, or that the artificial propagation of cancer resembles the grafting practised by horticulturists in the propagation of plants and trees.

Thus at present any attempts to directly ascertain the cause and nature of cancer are surrounded by so many sources of fallacy that, to my mind, they remain to-day as unprofitable as they have been in the past. The attempt to produce cancer experimentally—for example, by chronic irritation, for what form of chronic irritation is constant throughout the vertebrate scale?—is also surrounded with great difficulty, not the least of which is the liability apparently inherent in all animals to acquire cancer in old age.

The constant association of cancer with old age suggests a direct attempt to ascertain the nature of the connection. But such a direct attack is unprofitable because it at once opens up the bigger problem, What constitutes senility itself? This is a problem at present beyond our powers. There has long been indirect evidence that the connection between senescence and cancer was local and not constitutional. Otherwise multiple primary growths would be the rule and not the exception. Our own observations show that the influence of age is active in relation to the origin of cancerous growth, and not in relation to its continuation; for cancer can be propagated almost better in young than in old animals. If it be permissable to formulate the association of cancer with old age in other terms, one may say that tissues which become cancerous alone escape the consequences of the senescence to which organisms as a whole succumb, or, that if cancerous tissues are also prone to succumb to senescence, they are able to recover from it. Stated in either way, the association of the origin of cancer with old age becomes a problem to be attacked after those formulated below, with reference to the continued growth of cancer, have been solved.

The artificial propagation of cancer tells us nothing directly as to the origin of cancer—it only indicates that the distinctive characters of any single malignant new growth, once acquired, are probably permanent; tor under artificial propagation different carcinomata of one organ (the mamma) retain their individual characteristics. They are not convertible into one another, nor do they merge into a common type. Artificial propogation gives the opportunity of studying many of the properties of malignant new growths in detail with a thoroughness unattainable in the case of sporadic tumours. It has already proved the inadequacy of the standards by which an anthropocentric pathology has attempted to measure the proliferation and probe the nature of cancer. The true measure of that proliferation has not yet been arrived at. Its study suggests what appears at first sight to be a series of new problems, but may really be restatements of old ones, namely, Why is the amount of the growth of cancer relatively greater than that of any vertebrate organism? Are growth and cell division always progressive? Is cancer subject to a process of natural decay, or if not, how is its energy of growth and assimilation maintained?

To all these questions it should be possible to obtain a definite answer with the means at our disposal, and once they have been answered the original problem, so long the object of futile direct attack, will present itself in another form, more approachable than the old problem, "What is the cause of cancer?" has proved to be. —*B.M.J.*

From *The Tiverton Gazette* :—

"To Messrs. ———

Sirs,—I have used your ——— Drinks for more than three years, and have not lost one calf, even though the land is much addicted to the production of that fatal malady."

Can he mean Varicose Veins?

HUMAN AND BOVINE TUBERCULOSIS.

By Professor Dr. H. Kossel, Giessen.

Ever since Villemin by his classical researches definitely proved that tuberculosis is an infectious disease, the relations between human and animal tuberculosis have been the object of investigation. Though general opinion favoured a belief in a close connexion between the two, donbts were occasionally raised. The solution of the problem by experiment was often tried, but no definite success was obtained. The difficulty of protecting the experimental animals from unintended infection by tuberculosis frustrated the majority of the attempts. Only when the discovery of the tubercle bacillus by Koch had shown what the infectious agent in tuberculosis was and where it was to be found, did thorough comparative studies become possible.

For the moment, however, the question seemed to be answered in the sense of a uniform germ common to the tuberculosis, at any rate, of the mammals. The micro-organisms cultivated from human tuberculosis resembled so closely those cultivated from "*Perlsucht*" in bovine animals, that no doubt of their identity seemed at that time possible.

It was not before 1896 and 1898 that Theobald Smith raised serious objections to the identity, based on comparative studies of tubercle bacilli from human, bovine, and porcine sources. He called attention to morphological differences apparent in cultures on artificial media as well as to differences in virulence for small animals. Later on Koch—by experiments carried out in common with Schütz on cattle, swine, and sheep—convinced himself that the baccilli of human tuberculosis differed from those of pearl disease. The practical conclusions which he drew changed the question into one of universal interest, for now it had become doubtful whether meat and milk derived from tuberculous animals—which, so far, had been universally considered as an important source of tuberculosis—were really dangerous to human beings. Medical and veterinary experts in all countries devoted themselves to the study of this question. Up to the present day such numbers of papers have been published on it that it seems impossible to deal with them thoroughly in a communication like the present, and this is my reason for refraining from giving a minute review of the literature, and for confining myself chiefly to detailing results which I have obtained during several years at the Kaiserliche Gesundheitsamt at Berlin in collaboration with Weber and Heuss.

Koch's new teaching may be thus summed up:—The tuberculosis of man and the pearl disease of cattle owe their wide distribution not to the same germ. By injection of cultures of tubercle bacilli under the skin of cattle it is possible to determine whether one has to deal with a germ from a human or from a bovine source. The tubercle bacillus derived from man cannot produce tuberculosis in cattle. Whether the bovine bacillus produces tnberculosis in a human being has not yet been definitely proved, but even if infection of humans by the bovine germ is possible, it is certainly of rare occurrence. To take measures against this remote possibility is therefore not advisable—or, to use Koch's own words in the German original, "*nicht für geboten.*" Koch's words apparently leave nothing to be desired in lucidity of expression, but nevertheless there are some who have not seen that there are really two questions involved:

1. Is *Perlsucht* in cattle spread by the same germ as tuberculosis in man?

2. Is man susceptible to the germ which causes pearl disease in cattle?

Let us begin with the former question:

Is Perlsucht in Cattle spread by the same Germ as Tuberculosis in Man?

If one follows Koch in cultivating the tubercle bacilli from tuberculous organs of cattle, cultures are obtained showing specific properties. The bacilli are mostly short, rather plump, and give the characteristic staining reactions of tubercle bacilli. They may be cultivated on artificial media, especially on beef serum with or without addition of glycerine. They grow on fluid media also. In glycerinized broth (2½ per cent.) they grow in the shape of a very tender, often hardly visible, pellicule. Sometimes this pellicule is more strongly developed, in which case, however, it does not increase uniformly in thickness, but shows wart-like excrescences. The bacilli change the reaction of the acid broth, as Smith showed, by giving to it a permanently neutral or feebly alkaline reaction.

They are highly pathogenic for mammals. Even small doses injected into guinea-pigs, rabbits, monkeys, sheep, goats, swine, cattle, cause progressive tuberculosis, leading to death in a comparatively short time. Especially for cattle their pathogenic power is high. After intravenous injection of minute doses the animals succumb to acute lung disease. A subcutaneous injection of 5 cg. of bovine bacilli in the neck of cattle causes tuberculosis at the place of injection, the disease at once spreading to the nearest glands. But the germs do not stop there; they spread all over the body of the animal and cause disseminated tuberculosis. The animals often succumb within six or eight weeks, but even in cases not so rapid the disease proceeds uninterruptedly.

When calves are fed on cultures of the bovine bacillus, severe tuberculosis of the alimentary canal and the glands connected with it ensues, and later on the lung and the serous membranes are affected.

If calves are made to inhale tubercle bacilli, even in small doses, caseous pneumonia ensues, to which the animals succumb rapidly. Should they recover from the acute inflammatory stage, a somewhat chronic disease develops, with pronounced tuberculosis of the serous membranes—a true picture of pearl disease. The changes in the latter respect are similar when the animals have been fed with bacilli.

There is no difference between cultures from organs of animals with extensive tuberculosis or merely with slight lesions, or even with a single tuberculous gland, the cultivated germs always showing a marked virulence for cattle.

Tubercle bacilli endowed with these properties are found in other tuberculous domestic animals, such as swine, sheep, and goats.

If the same methods are employed for investigating the products of disease in consumptive persons, tubercle bacilli are met with which differ somewhat from those described above. To begin with, the morphological features in the cultures are generally different; more slender and longer forms are prevalent, and many are curved. They grow more luxuriantly on artificial media, and thrive especially on glycerinized broth. Broth inoculated with freshly-isolated bovine bacilli generally covers itself with a thin pellicule only, but after inoculation with tubercle bacilli from consumptive persons a film is formed, which grows quickly and soon covers the broth with a thick, wrinkled skin. On broth containing 3 to 5 per cent. of glycerine and a certain degree of acidity the bacilli, according to Smith, produce considerable and steadily-increasing quantities of acid.

The action of human bacilli on various animals is different from that of bovine bacilli. In animals as susceptible to tuberculosis as guinea-pigs the difference is not sufficiently well marked; it is more so in rabbits. The latter withstand injection of doses which in the case of bovine bacilli would have caused fatal tuberculosis. Vagedes, Dorset, Beck, and Heymans obtained the same results, and even Villemin, in his original experiments, as well as later on Orth and von Baumgarten observed a difference in the susceptibility of rabbits to tuberculous matter derived from cattle and man respectively. They are, however, by no means immune against human bacilli; for while an injection of the latter into the blood-stream will cause tuberculosis and is a severe infection, rabbits will frequently recover from it, whereas they succumb quickly and without exception to the same dose of bovine bacilli.

The difference between bacilli of the typus humanus and those of the typus bovinus, as they have been called, is more obvious in cattle than in rabbits. For instance, in contrast to what has been just stated, a subcutaneous injection of 5 cg. of bacilli belonging to the typus humanus causes in cattle only a local reaction at the seat of infection and in the neighbouring glands, and, moreover, this reaction decreases, and even after protracted observation no spreading of the disease to the internal organs is noticeable.

As the local reaction may, however, be violent at first, the bacilli should not be introduced into parts of the organism like the lungs, where such a reaction might by itself endanger the animal's life.

The difference between the two types is specially apparent when the animal is made to swallow or inhale the bacilli. Then even three months' feeding of cultures of the human type has only caused accumulation of the bacilli in the mesenteric glands without other changes than calcification having been produced, certainly without dissemination into other parts of the body, as in experiments with the bovine type. We found them entirely without effect when cattle were fed on tuberculous sputum; but this mode of experimenting seems undesirable on account of the numerous non-specific bacilli present in sputum.

When cattle were made to inhale bacilli of the human type no changes were found after inhalation of doses that in the case of bovine bacilli would most certainly have produced progressive tuberculosis. But hers also there is a limit that must not be exceeded, otherwise acute inflammatory changes of the lungs ensue which are not characteristic of tubercle bacilli, and may be caused by inhalation of saprophytic bacilli such as the *Bacillus phlei*.

The difference in virulence between the two types can also be observed in goats and swine. The latter seem, however, to be susceptible to a certain degree to the bacilli of the human type, as proved by experiments in feeding; but even here the bacillus of the bovine type is the more viruient. A third tubercle bacillus entirely differing from the two types described above is found in tuberculous fowls. This so-called avian tubercle bacillus is recognised as different even by some of those who do not agree with the separation into two types of the mammalian tubercle bacilli.

The tuberculosis of our domestic fowl seems to be exclusively caused by infection with these avian bacilli. But there are other birds which are also susceptible to tubercle bacilli of the human type, as has been observed in parrots by Strauss, Weber, and Heuss, and L. Rabinovitsch. A parrot can therefore be infected by a consumptive person and itself contribute to the spread of human tuberculosis.

The view maintained—especially by Lignières amongst others—that the tubercle bacilli of mammals can be separated into two types, has met with opposition. Some say that the differences described above are not constant enough to justify a separation into two types; that, for example, on microscopic examination certain morphological differences are not always observable.

As to this, attention may be called to the fact that for comparisons only comparable material must be used.

If in one case the microscopic preparations are made from young cultures, in another from old ones, if first one then another nutritive medium is used, it is impossible to arrive at a correct conclusion. Cultures on serum can be compared only with serum cultures of the same age; cultures on broth only with others on the same broth. All other conditions should correspond accurately; for example, the temperature of the incubator and the method and duration of the staining process.

Finally, here as well as in other comparative researches, fresh strains must be used which have been recently isolated from the animal body. If all these points are carefully observed then certain differences between the two types are unmistakable. On serum the tubercle bacilli of the typus bovinus are mostly considerably shorter and more plump than those of the typus humanus. When cultivated on broth the tubercle bacilli of the typus bovinus are distinguishable by an irregular absorption of the colouring matter used and their variable shape. Again, different is the appearance of the tubercle bacilli of fowls.

All the same, I would not advise, especially in the case of inexperienced observers, that opinions about the origin of the bacilli should be based on their morphology alone. Only the consideration of all the distinguishing signs can give adequate assurance in separating the types. Not only the shape, but also all the conditions of growth, as indicated above, on nutrient media, especially on broth with 2½ per cent. of glycerine, and the pathogenic power for rabbits and cattle must be taken into consideration. Another distinguishing mark has been described oy Arpad; his cultures of human tuberculosis show a reddish-yellow tint, which is not the case with bovine cultures. Beck found differences in virulence for rats, besides morphological and biological incongruities.

As to the pathogenic power one has, however, often heard the opinion that the differences between the typus humanus and the bovinus are not constant but rather differences of quantity than of quality. The tubercle bacilli from cases of tuberculosis in cattle were, for instance, not at all alike as to virulence for cattle after subcutaneous injection. It must, however, be remembered that the virulence of the various strains varies within certain limits in bovine bacilli; as is the case with all bacteria. Nevertheless, I have never cultivated a strain from tuberculous cattle which did not possess the power of producing progressive tuberculosis in cattle after subcutaneous injection of 5 cg.

In many cases the cause of erroneous views may be found in faulty experiments. Thus, for example, varying results have been obtained by those who did not inoculate the animals with cultures, as Koch advised, but with pieces of tuberculous organs. Such experiments occasionally gave no result at all, or disagreed altogether in their results with other experiments. And no wonder—for the animals treated with pieces of diseased organs were inoculated in one case with numerous, in another with only a few, living tubercle bacilli, just according to the state of the diseased piece used and the number of specific germs contained in it. Since, however, the number of the bacilli inoculated is not by any means an unimportant matter, the infection of the animal succeeded in one case while it failed in another.

These discrepancies can be avoided by careful dosage, and this again is possible only when accurately measured quantities of broth cultures are used. Should even then an animal not fall ill with generalised tuberculosis after subcutaneous injection of 5 cg. of bovine bacilli, the experiment must be repeated in another animal, for sometimes cattle are met with which possess a higher degree of resistance against subcutaneously-injected tubercle bacilli than others do, a fact for which previous spontaneous infection or differences of breed may possibly account. The experiments should, therefore, be made on animals of nearly the same age and of the same breed. For the same reason also the experiments should be as far-reaching as possible, so that one may not be led to upset a rule for the sake of an apparent exception. In our experiments, for example, inoculations with 27 different strains of the typus bovinus yielded disseminated tuberculosis in 32 out of 33 cattle—that is, in 97 per cent., while the injections of 38 different strains of the typus humanus into 44 cattle produced local lesions only.

Now some observers, amongst others Arloing and De Jong, hold the view that it is possible to produce tuberculosis in cattle by cultures of the typus humanus. They base their opinion on observations made with injections of tubercle bacilli into the jugular vein of cattle, and it must be admitted that they succeeded in killing cattle or producing tubercles by injecting suspensions of human tubercle bacilli into the jugular vein. But these experiments were made with such enormous qualities of bacilli that they cannot be looked upon as deciding the question. The animals did certainly not contract progressive tuberculosis such as develops after intravenous injection of even minute doses of the typus bovinus. Finally, it is not remarkable if an animal succumbs when the capillaries of its lungs have been blocked by the bodies of bacteria containing such irritating substances as the tubercle bacilli, or that the germs should not disappear without leaving behind certain reactions in the tissues.

But such reactions, which can be observed even after injection of dead tubercle bacilli or of other acid-fast bacilli, are not to be confounded with progressive tuberculous lesions.

Likewise, one cannot be surprised if the injected bocilli of the typus humanus withstand the destructive and dissolving influences of the tissue fluids for a long time, even in non-susceptible animals. This pecularity is accounted for by the special substances contained in the cells of the tubercle bacilli, and it appertains not only to them but also to other micro-organisms known as acid-fast bacilli. When taking note of all these circumstances, which must never be overloked in experimenting with tubercle baccilli, one cannot avoid the conclusion that two types of mammalian tubercle bacilli exist, and that tuberculosis of cattle owes its distribution to the bacilli of the one type (typus bovinus) while human tuberculosis is spread chiefly, as we shall see later on, by another type, the typus humanus. Besides those investigators who deny *in toto* the differences between the two types there are some who acknowledge the existence of differences, but do not consider them essential, chiefly because it is assumed that the two types can be transformed into one another. This opinion is based on the experiments of von Behring and De Jong, according to whom passage through goats is able to change the bacillus of the typus humanus into the typus bovinus.

Experiments on transforming one species of bacteria into another have played an important part prior to the introduction of Koch's methods. Some bacteriologists seem to have forgotten how little the conversions, said to have been successful, were able to withstand the tests of strictly accurate methods. While the sources of error are considerable even in endeavouring to obtain the conversion on artificial culture media, the difficulties increase when the animal body is made use of. In this connection may be mentioned the supposed conversion of the tubercle bacilli of warm-blooded animals in the bodies of poikilothermes. Quite recently the experiments of Weber and Taute have thrown light on this subject.

Bataillon, Dubard and Terre, Möeller, Lubarsch and Dieudonné, and Herzog respectively asserted that they had succeeded in changing the mammalian tubercle

bacilli by introducing them into cold-blooded animals. After more or less prolonged sojourn in the organism of the latter the mammalian tubercle bacilli are said to have been changed to such an extent that their optimum of growth was attained at low temperatures, and that they lost all virulence for warm-blooded animals. But it is strange that the different observers did not succeed equally quickly. In some cases forty days sufficed for the change, but in subsequent experiments no success was obtained in transforming the tubercle bacilli, even after leaving them for nine and a half months continuously in the body of cold-blooded animals.

In consequence, Auché and Hobbs, Sion, Herr, Cornet and Meyer and Morey disputed this assumption. Weber and Taute, on the other hand, were able to prove that the tubercle bacilli of cold-blooded animals supposed to be derived from the mammalian bacilli were nothing else than the widely-prevalent saprophytes found, for instance, in soil, moss, and mud, which, however, only agree to a certain extent as regards the acid-fastness with the true tubercle bacilli, but otherwise have no connection with them. They had been transferred from the organs of the cold-blooded animals, where they are found even in healthy subjects, to the nutritive media used by the experimenters, and thus had wrongly been looked upon as a transformation of the inoculated germs.

This example clearly shows how much care is needed in forming an opinion as to the experiments of transformation. The apparent change of the human into the bovine type is probably to be explained in a similar way. The assumption is justified that, in the experiments published up to now, not the inoculated bacilli have been recovered from the animals through which they had passed, but other micro-organisms which had found their way into the animals by uncontrolled and uncontrollable means. This applies both to von Behring's and to De Jong's experiment.

If one leaves a goat, as De Jong did, for three and a half years after inoculation with tubercle bacilli of the typus humanus before recovering cultures from it, it is within the range of possibility, especially in view of the wide distribution of tuberculosis among domestic animals, that tubercle bacilli of the typus bovinus would also find their way to the experimental animal and infect it. Moreover, the goat, according to De Jong, was used also for other experiments. Tuberculin preparations from different cultures of tubercle bacilli were repeatedly injected, and presumably among them tuberculin preparations of bovine bacilli.

I have no reason for doubting that the tubercle bacilli cultivated from the animal in question belonged to the typus bovinus, but, on the other hand, proof is wanting that they were derived from the tubercle bacilli of the typus humanus originally introduced into the goat.

In any case the first thing needful was that an animal used for so important an experiment should not be subjected to other tests also, which, irrespective of other sources of error, are capable of diminishing the resistance of the animal to secondary infection. The fact that the fatal disease did not begin until three years after the inoculation had taken place is suggestive of its secondary character.

The experiments made by Weber, Heuss, and myself in passing bacilli of the typus humanus through goats had the result that the germs, even after five passages, retained the typus humanus and did not change. After repeated passages through cattle, also a change into the other type did not once occur. With such a result of our experiments we could rest assured that we had really to deal with the offspring of the germs previously injected, although they had remained a long time in the organisms of the experimental animals—namely, in goats up to 202 and in cattle up to 381 days. Our results, therefore, agree with those of Gratia, Möeller, and Lignières, who also did not succeed in changing the bacilli by passage through animals.

Arrangements for experiments in which sources of error cannot be avoided, as is the case in passage experiments, should not be made use of for decisions as to the question of identity, because they only lead to confusion. The same is applicable to the experiments of some investigators who endeavour to efface the differences as much as possible by subjecting the culture of the tubercle bacilli to all sorts of artificial influences. That bacteria can, for instance, ultimately be robbed of their virulence is sufficiently well known, but this does not prove anything in the present question. It is the misfortune of those devoted to these researches that tubercle bacilli mostly retain their peculiarities with great tenacity.

The theory that the tubercle bacilli of the typus bovinus change into the typus humanus after having been some length of time in the human body has not been proved either. On the contrary, the cases in which bacilli of the typus bovinus have been cultivated from the human body point to their retaining their peculiarities even when growing in the human organism.

From observations of Spronck and Hoefnagel it is evident that in the case of persons having contracted tuberculosis of the skin by infection with bacilli of the typus bovinus, the tubercle bacilli recovered in cultures several years after their entrance into the human skin presented the typus bovinus to a pronounced degree.

Furthermore, it must not be assumed that the bacilli of the typus bovinus should in such a susceptible organism as the human one change into another, less virulent, form ; while this change does not take place in the case of cattle, sheep, swine, monkeys, and many smaller animals. In fact, it has been strongly asserted by different observers that the strains of the typus humanus cultivated from human organisms can in no respect be distinguished from the strains cultivated from tuberculous lesions of cattle.

Finally, it is raised as an obj ction to the separation of the mammalian tubercle bacilli into two types that it is possible to immunise cattle with the aid of tubercle bacilli of the typus humanus against the bacilli of the typus bovinus. This fact is adduced as proving that one is dealing with one and the same germ, on the ground that immunity against a bacterium can only be produced by an identical micro-organism. Especially von Behring and Lorenz have emphasised this fact as conclusive. On the other hand, it must be remembered that immunity in this direction is not equally specific in all species of bacteria. The fact that efficient tuberculin can be prepared from avian tubercle bacilli as well as from mammalian by itself suggests caution in applying to tuberculosis such experiences as have been gained with regard to immunity in other groups of bacteria. Furthermore, Beck observed that animals injected with acid-fast bacilli had become hypersensitive to tuberculin ; and Koch stated that by injection of tubercle bacilli into animals a serum could be produced which possessed agglutinating power not only on tubercle bacilli, but also on saprophytic acid-fast bacilli.

Finally, opinions are not wanting that the treatment of experimental animals with saprophytic acid-fast bacilli—that is, by micro-organisms in no way identical with tubercle bacilli—has a protective influence against the infection by tubercle bacilli (Moeller, Friedmann). I do not deny that the tubercle bacilli of the typus humanus are nearly related to those of the typus bovinus, and that their origin may be traced to a common stock ; but these are considerations for which sufficient foundation is wanting. To-day we are dealing with two types that do not play the same part in the distribution of tuberculosis in animals and man, and therefore must not be confounded. It is not essential

whether these types are defined as different species, or races, or varieties, for in any case they are not identical.

And now we have arrived at the second question :

Is Man Susceptible to that Disease Germ which Causes Perlsucht in Cattle?

This question must be answered in the affirmative.

It has been shown by a number of investigators—among whom Ravenel, Smith, Fibiger and Jensen, Lignières, de Schweinitz, Dorset, and Schroeder may be mentioned, owing to the number of their experiments—that the micro-organisms found in certain forms of human tuberculosis act on cattle and otherwise behave just as does the bacillus of bovine tuberculosis. The result of the far-reaching experiments conducted under my direction in the Gesundheitsamt at Berlin has been to show that in human tuberculosis tubercle bacilli may exist that correspond in every respect in their morphological, biological, and pathogenetic qualities to bacilli of cattle tuberculosis—that is, such as belong to the typus bovinus.

Among 56 cases of human tuberculosis we found these germs 6 times—that is, in 10 per cent. of the cases. It would, however, be erroneous to conclude from these figures alone that 10 per cent. of all cases of human tuberculosis in Berlin were caused by infection with tubercle bacilli of the typus bovinus, and that for the following reason : We included in the number of our experiments chiefly cases in which we could assume that the tuberculosis owed its origin to an intestinal infection, and possibly, therefore, to food containing tubercle bacilli.

Tubercle bacilli of the typus bovinus appear chiefly in tuberculous lesions in children, and among our cases we found that, with one single exception, it was the mesenteric glands or intestinal ulcers that contained the bovine germs. When, on the other hand, the sputum of adults suffering from pulmonary phthisis—the most widespread form of tuberculosis—was examined, only bacilli of the typus humanus were found. That tubercle bacilli of the typus bovinus can, however, also enter the adult body was ascertained by our finding them, together with those of the typus humanus, in a case of extensive tuberculous ulcers of the intestines in a woman.

This latter observation also taught us that an infection by tubercle bacilli of the one type may be accompanied by an infection by those of the other. Ulcers of the intestine are probably highly favourable to the absorption of tubercle bacilli from food. Which of the two tubercle bacilli most frequently paves the way for the other only further experiments can show.

When surveying the experiments of other investigators, it is often difficult, or even not possible, to compare them with our own, as different methods have been employed. But still one may conclude with safety from the material to hand that over and above those already mentioned, amongst others Thomassen, Westenhoeffer, De Jong, Stuurmann, Dammann, Hamilton and Young, Eber, and the English Royal Commission on Tuberculosis, were working on cultures of the typus bovinus or other material which contained tubercle bacilli of this type. Also by the experiments of these investigators we are taught that just those cases of tuberculosis in which the digestive organs may be considered as the point of entry of the infection owe their origin to infection by bovine germs.

When bovine bacilli have been found in humans, the original material has mostly been derived from cases of tuberculosis of the intestines, of the mesenteric glands, of the glands of the neck, or of the peritoneum. Moreover, tuberculosis of the skin due to infection with tubercle bacillus of the typus bovinus has been observed as a disease to which persons are specially subject who, like butchers, come into frequent contact with meat or with excretions of cattle infected with pearl disease. Excepting these latter observations, the experiments made by different investigators in countries widely distant from each other point to tubercle bacilli of the typus bovinus as infective agents, particularly in such cases of human tuberculosis in which transmission of the germs by food cannot be excluded, or is even highly probable.

Tubercle bacilli can, however, find their way into the digestive organs also by other means. Bacilli that have been inhaled may be deposited in the mouth and thence enter into the nearest glands, or they may be swallowed and absorbed by the intestinal mucous membrane. The same thing may happen when tubercle bacilli are introduced into the mouth by unclean hands, utensils, or toys. Furthermore, food may be polluted by bacilli which are derived from consumptive persons and have fallen into the food. Milking cows by hand, making butter and cheese, and the milk trade generally give opportunity for pollution even before the food has been delivered to the consumer. But especially in a household of which a consumptive person is a member, carelessness or want ef cleanliness may expose the children to the danger of infection with tubercle bacilli when taking food.

The fact that a child suffers from primary tuberculosis of the intestines, therefore, does not prove that the disease is due to tubercle bacilli derived from an animal, for instance, from the udder of a tuberculous cow and transmitted into the food. For this reason in cases of primary tuberculosis of the intestines or mesenteric glands, tubercle bacilli of the typus humanus are at least as often found as those of the typus bovinus. But the fact that cases exist, where the primary infection of the alimentary canal is due to tubercle bacilli of the typus bovinus, points to cattle as being a possible source of infection of human beings.

We have now still to investigate to what extent the distribution of tuberculosis in human beings is attributable to infection from the bovine source. Koch estimates the extent of infection by the milk and flesh of tuberculous cattle, and by the butter made of their milk, as being hardly greater than that of hereditary transmission. Of late years observations have been published which show that in some countries the spread of human tuberculosis is entirely independent of the tuberculosis of animals. When in London, Koch called attention to the fact of how often milk and butter containing tubercle bacilli is consumed in large towns and how comparatively rarely intestinal tuberculosis occurs. In Japan milk and products of milk play, according to Kitasato and others, no part in food of the inhabitants and still tuberculosis, and even intestinal tuberculosis, is at least as widely distributed there as in European countries, where the consumption of milk and its products is general. In Greenland, according to Rördam, feeding infants with cow's milk is entirely out of the question on account of the scarcity of cattle, and yet the Greenlanders, according to Kjier, succumb to tuberculosis in great numbers, particularly in youth. In Germany, von Behring and Biedert did not succeed in establishing by statistics the relative frequency of tuberculosis in cattle and in man ; no more was Flügge able to determine the influence of feeding infants with cow's milk on the frequency of consumption.

This also seems to demonstrate that occasionally an infection from the bovine source occurs, but, on the other hand, that the tuberculosis of cattle is not responsible for the extrao dinary distribution of consumption. To this it may be objected that the infection from bovine sources would with us be much more frequent if milk were not boiled, as it very generally is before being consumed, and if the inspection of meat were not carried out as stringently as it is. As to this latter, it must, however, be remarked that its great advantage in

a sanitary respect lies in a different direction. In any case, the muscle itself, according to general opinion, rarely conveys tubercle bacilli. Also the boiling of milk alone cannot have the influence in question, as milk even to-day is often consumed raw, especially by children over 1 year of age. Butter and cream are nearly always consumed without having been previously heated. Further research alone can give new light in this respect, especially in countries or districts where children are still frequently brought up on unboiled cow's milk.

The recent investigations of Heller and his followers seems to show that intestinal tuberculosis is more frequent in some districts than in others. It would certainly be worth while to look further into the causes of this fact. After what has, however, just been said it would not be right to at once attribute these intestinal infections to cow's milk. Moreover, it would be desirable to search as carefully in the respiratory organs as it is already done in the mesenteric glands for primary tubercular foci.

Facts ascertained so far by no means speak in favour of the view that the infections with tubercle bacilli derived from cattle are a greater danger for man than a transmission of bacilli from human sources. From the fact that the tubercle bacillus of the typus bovinus has always been proved to be the more virulent one for experimental animals, conclusions must not be drawn as to its effect on human beings, and this also in view of the experiments of von Baumgarten and F. Klemperer. Tuberculosis in cattle has existed with us for a long time, and therefore also the transmission of tubercle bacilli from animals to man. For this reason persons to whom tuberculosis was conveyed from bovine sources must have had ample opportunity of transmitting the bovine germs to their fellow-beings. Consequently, tubercle bacilli of the typus bovinus ought to have been found also in many cases of consumption which have resulted from an infection from man to man. In all the literature on this subject which has come under my notice, the only case in which an adult consumptive expectorated bacilli of the typus bovinus is the one described by Stuurmann, and even there the patient was considered as having been infected directly from cattle.

From the experiences gained hitherto, the inference may be drawn that an infection which a human being receives from cattle is not easily transmissible to other human beings, and in most cases, therefore, does not lead to the spread of the disease.

Finally, attention must be called to the fact that in those cases where tubercle bacilli of the typus bovinus have been found in human beings the course of the disease was by no means distinguished by particular malignancy. On the contrary, calcified foci in the mesenteric glands, which were accidentally found in children having succumbed to other diseases, have also supplied highly virulent bacilli of the typus bovinus.

In any cases, the observation at hand suffice to justify the demand that the measures against transmission of tuberculosis by food should remain in force to the present extent, and yet there is no reason to extend them; on the contrary, Koch's warning should be earnestly taken to heart that through over-estimating the danger impendent from tuberculous cattle, the more important problem should not be neglected—that is, the prevention of the transmission of tuberculosis from man to man. I therefore arrive at the following conclusions:

1. By bacteriological investigation of tuberculous lesions in human beings, cattle and swine, two types of tubercle bacilli can be detected which may provisionally be called typus humanus and typus bovinus.

2. The widely-spread tuberculosis of cattle is to be traced exclusively to infection with tubercle bacilli of the typus bovinus.

3. Swine are susceptible to a high degree to the tubercle bacilli of the typus bovinus, in a lesser degree to those of the typus humanus.

4. The tuberculosis of human beings chiefly arises from infection with tubercle bacilli of the typus humanus, which is transmissible from man to man.

5. Tuberculous lesions in human beings can be produced by tubercle bacilli of the typus bovinus.

6. Tubercle bacilli of the typus bovinus can be transmitted to human beings by food derived from tuberculous animals, especially by milk of cows affected with tuberculosis of the udder.

7. The part played by infection from bovine sources in spreading tuberculosis in man is small in comparison to the danger threatening from a consumptive human being.—*B.M.J.*

PULMONARY TUBERCULOSIS AND INTESTINAL INFECTION.

Prof. M. H. Vallée (*Annales de l'Institut Pasteur*, Oct. 25, 1905) lends his support to the view that pulmonary tuberculosis is often due to infection by the intestinal route. He took two young calves and inoculated into each 10 mg. of bovine bacilli by the intratracheal method. The animals developed normally and were killed six months afterwards. They both showed post-mortem a tuberculous focus at the point of penetration of the needle, and about a dozen tuberculous vegetations on the visceral pleura, whilst the lungs, bronchial glands, and mediastinal glands were free from disease. Professor Vallée has also observed the effect of introducing virulent tubercle bacilli into the nasopharynx of young calves. Of twelve animals so treated only four suffered from more than transient lesions. These four showed disease of the retropharyngeal glands and, in some instances, also of the cervical and tracheal glands, but in every case all the viscera, and also the bronchial and mediastinal glands, were found to be normal. The absence of disease, therefore, in the lungs and bronchial glands of all these animals is regarded as showing that the calf exhibits a high degree of resistance against infection directly introduced into the respiratory tract.

These results Professor Vallée contrasts with the lesions produced when the infection is introduced directly into the digestive system. He allowed four very young calves on two occasions, at intervals of forty-eight hours, to suck a cow suffering from tuberculous mastitis. All the animals became tuberculous. They were killed at periods ranging from 54 to 146 days after the commencement of the experiments. The necropsies showed that in every case the bronchial and mediastinal glands were markedly affected. In three of the animals the lesions in these glands were much more conspicuous than those in the mesenteric glands, and in none of the animals were lesions found in either the liver or the spleen. The lungs were not affected, but there was tuberculosis of the diaphragm. On two more calves Professor Vallée performed laparotomy, and introduced 1·5 mg. of bovine tubercle bacilli, in the one instance into a mesenteric gland, and in the other into a mesenteric vein. The main interest of these experiments lies in the fact that here again, where there could be no possibility of any bacilli having been accidentally introduced into the air passages, tuberculosis of the bronchial glands was produced.

As the general result of his experiments, Professor Vallée concludes that tuberculosis due to an infection through the alimentary tract is probably much commoner in man than is generally supposed; and he regards it as a highly significant fact that tubercle bacilli may travel from the intestine to the bronchial glands, and multiply in the latter situation, without leaving behind them lesions either in the intestinal mucosa or in the mesenteric glands.—*B.M.J.*

DISEASES OF ANIMALS ACTS 1894 TO 1903. SUMMARY OF RETURNS.

Period.		Anthrax.		Foot-and-Mouth Disease.		Glanders (including Farcy)		Rabies. Cases Confirmed.		Sheep Scab.	Swine Fever.	
		Out-breaks	Ani-mals.	Out-breaks	Ani-mals.	Out-breaks	Ani-mals.	Dogs.	Other	Out-breaks	Out-breaks.	Slaugh-tered *
GT. BRITAIN. Week ended Jan. 13		10	14			29	51			31	15	93
Corresponding week in	1904 ..	18	28			26	42			37	18	51
	1903 ..	18	22			22	52			90	29	87
	1902 ..	11	14			21	46			89	42	249
Total for 2 weeks, 1905		29	36			52	87			52	34	153
Corresponding period in	1904 ..	46	91			53	82			106	33	95
	1903 ..	35	41			48	98			200	54	252
	1902 ..	26	38			43	74			177	72	409

Board of Agriculture and Fisheries, Jan. 16. 1906.

IRELAND. Week ended Jan. 6		..	..	..	..	..	2	..	..	18	..	..
Corresponding Week in	1905 ..	..	..	..	..	1	1	..	..	25	1	1
	1904 ..	..	..	..	..	1	1	..	..	14	2	53
	1903 ..	..	..	..	..	..	..	..	..	8	..	4

Department of Agriculture and Technical Instruction for Ireland, (Castle Street), Dublin, Jan. 11, 1906.

NOTE.—The figures for the Current Year are approximate only. * As Diseased or Exposed to Infection.

COMPARATIVE SUMMARY OF RETURNS—PARASITIC MANGE, IN IRELAND.

	1905	1904	1903	1902
Outbreaks in December	6	9	7	16
„ Twelve Months	169	162	195	161

Co. Waterford and the Agricultural Department.*

"We are asked to publish the following correspondence :—

Tallow, Co. Waterford,
January 4, 1906.

Sir,—I am directed by my Committee to acknowledge the receipt of your letter of December 13th, and to say that Mr. Dobbyn's accounts were unanimously rejected at two meetings of the County Council as well as by my Committee, who now decline to reconsider the matter of payment. My Committee are not quite so stupid as to need their attention being called to the fact that your Department would, in the first instance, pay half the amount claimed, and still less derelict of intelligence not to be aware that eventually the whole of it would come out of the taxpayer's pockets.

My Committee desire to point out that your letters come quickly to hand when they refer to payments, or making orders which means the same, but that they are consistently ignored when orders are being issued restricting the movements of horses into or out of their county to shows. If my Committee were consulted, as they believe they should have been, even as a matter of courtesy, senseless orders would not have been issued with their concurrence. They would have pointed out that if it was right to prohibit horses from this county going to Clonmel Show on August 3rd, that it was still a greater necessity to prohibit their going to Clonmel Fair on the previous day. That if it was right to prohibit horses going to New Ross Show on the 10th July, it was a greater necessity to prohibit their going to New Ross Fair on the previous day.

Your Department issued an order which was extensively published in September last, prohibiting horses going to Kilkenny Show on October 10th, but nothing about the fair on the 11th. Notwithstanding this order the number of horses exported from Waterford for September and October, 1905, exceeded the corresponding period, 1904, by one hundred and seven. It may be that the heads of the Veterinary Branch are wiseacres and the buyers are fools. The public are good judges. What do you think they believe?

In seven different stables this "epizootic lymphangitis" was found, but judging from the panic that sprung up in your Veterinary Branch, the public in other parts of Ireland, and indeed in England, were given good reason to believe that it was in every "nook and corner" in this county.

The "man in the street" knew where this disease was for over a year before your Veterinary Branch awoke to their duty, and from the way they carried it out, it is to be sincerely regretted that their slumbers were ever disturbed.

What is the opinion held by the people all over the South of your Veterinary Branch's administrative capabilities?

I beg to enclose copy of resolution unanimously passed by my Committee on yesterday.—I am, sir, your obedient servant,

JOHN M'GRATH,
Clerk to Local Authority.

The Secretary, Department of Agriculture and Technical Instruction for Ireland, Upper Merrion Street, Dublin.

Resolved—That we, the Executive Committee, appointed under the Diseases of Animals Acts by the Waterford County Council, hereby protest in the strongest manner against the high-handed action of the Veterinary Branch of the Department in issuing orders

* An earlier note on this subject appeared in our issue of Sept. 16, p. 194.